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Loneliness and depression in the elderly: the role of social network

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Abstract

Purpose. Loneliness and depression are associated, in particular in older adults. Less is known about the role of social networks in this relationship. The present study analyzes the influence of social networks in the relationship between loneliness and depression in the older adult population in Spain.

Methods. A population-representative sample of 3535 adults aged 50 years and over from Spain was analyzed. Loneliness was assessed by means of the three-item UCLA Loneliness Scale. Social network characteristics were measured using the Berkman–Syme Social Network Index. Major depression in the previous 12 months was assessed with the Composite International Diagnostic Interview (CIDI). Logistic regression models were used to analyze the survey data.

Results. Feelings of loneliness were more prevalent in women, those who were younger (50–65), single, separated, divorced or widowed, living in a rural setting, with a lower frequency of social interactions and smaller social network, and with major depression. Among people feeling lonely, those with depression were more frequently married and had a small social network. Among those not feeling lonely, depression was associated with being previously married. In depressed people, feelings of loneliness were associated with having a small social network; while

among those without depression, feelings of loneliness were associated with being married.

Conclusion. The type and size of social networks have a role in the relationship between loneliness and depression. Increasing social interaction may be more beneficial than strategies based on improving maladaptive social cognition in loneliness to reduce the prevalence of depression among Spanish older adults.

Introduction

Loneliness has been defined as a discrepancy between desired and real social relations [1] and is associated with decreases in health status and quality of life [2]. The prevalence of chronic or frequent loneliness in Spain has been estimated at 4.4% for individuals aged <30 years, 6.5% for individuals between 30-59 years, and 11.5% for those aged ≥ 60 years [3]. Gender, age, marital status, employment status, education level, household income and urbanicity are socio-demographic factors associated with loneliness [4].

The association between loneliness and depression is well documented. Cacioppo et al. evidenced a strong association between loneliness and depression among older adults. They also observed that loneliness and depressive symptomatology can act in a synergistic way to diminish well-being in middle-aged and older adults [5]. Depression, as well as loneliness, has also been associated with the components of social networks (i.e., frequency of interactions and quality and size of social network). In a systematic review of the association between social relationships and depression, Santini et al. highlighted the protective effects of perceived emotional support, perceived instrumental support, and large, diverse social networks [6] whereas in another review, Cohen-Mansfield et al. identified quantitative and qualitative social network factors as also being related to loneliness [4].

However, whether loneliness causes depression or depression increases the feelings of loneliness, or both, has not been fully established. Strong evidence was provided by a 5-year longitudinal study on older adults conducted in Chicago which showed that loneliness predicted subsequent increases in depressive symptomatology, but not vice versa [7]. Conversely, a national longitudinal study among older adults in Sweden showed that increases in depressive symptomatology predicted loneliness [8].

Discordant findings have been reported in the relationship between loneliness, social networks and depression. In a study using data from the Irish Longitudinal Study on Ageing (TILDA), loneliness was found to be a significant mediator in the association between social network related factors and depression [9]. On the other hand, in a longitudinal study conducted in Chicago, the researchers reported that the temporal association between loneliness and depression was not attributable to the size or quality of social networks [7]. In the context of the Longitudinal Aging Study Amsterdam, Houtjes et al. found that both loneliness and social network had an independent effect on the course of depression: the size of social network and degree of loneliness were both important predictors of the remission of depression among older adults [10].

These contradictory results could be a consequence of the different conceptualizations of loneliness used in the previous studies. The UCLA loneliness scale, the most frequently employed method to assess loneliness, was conceived as measuring a uni-dimensional construct [11]. However, several factor analyses are consistent with conceptualizations of loneliness as a multi-dimensional construct [12]. Weiss [13] proposed two types of loneliness: emotional loneliness, which results from the perception of lacking of an intimate attachment to another person; and social loneliness, which results from the perception of lacking of a network of social relationships in which the person is part of a group. Marital status and social network components have been found to be strong predictors of emotional and social loneliness, respectively [14]. According to Weiss, social loneliness is the type of loneliness which predicts depression.

The aim of the present study is to better understand the relationship between loneliness, social networks and depression and, specifically, whether Weiss's

conceptualization of two types of loneliness may explain the role of loneliness and social networks in depression and the role of depression and social networks in loneliness. The tested hypotheses were: 1) the role of the different social network components in loneliness differs in individuals with or without depression; 2) the role of the different social network components in depression differs in individuals with or without loneliness.

Methods

Study design

This study was part of the Collaborative Research on Ageing in Europe (COURAGE in Europe) project [15], a European funded, cross-sectional survey of a non-institutionalized adult population (aged ≥ 18 years) conducted between April 2011 and May 2012. A total of 4,753 participants were interviewed in Spain: 962 (18–49 years), 3,312 (50–79 years) and 479 (80+ years). In order to achieve appropriate representation of the Spanish population, a stratified multistage clustered area probability method was used. Subgroups 50+ and 80+ years were oversampled, given that these individuals were the main target of the study. The survey response rate was 69.9%.

Face-to-face structured interviews were carried out at respondents' homes using Computer-Assisted Personal Interviewing (CAPI). The survey questionnaire was initially developed in English and then translated into Spanish following World Health Organization translation guidelines for assessment instruments [16]. Quality assurance procedures were implemented during fieldwork. When individuals had severe cognitive impairment, judged at the interviewer's discretion, a shorter version of the questionnaire was administered to a proxy.

For the current analyses, we excluded proxy respondents (n=170) and 86 individuals with missing information on loneliness or social networks. Individuals aged <50 years (n=962) were also excluded. Thus, the final analytical sample comprised 3,535 participants.

Ethics statement.

Ethical approval for the COURAGE study Spain was provided by Parc Sanitari Sant Joan de Déu, Barcelona, Spain, and Hospital la Princesa, Madrid, Spain. Written informed consent was obtained from the participants.

Measurements

Loneliness

Loneliness was assessed by means of the 3-item UCLA Loneliness Scale [17], which consists of the following items: “*How often do you feel that you lack companionship?*”; “*How often do you feel left out?*”; and “*How often do you feel isolated from others?*”. Each item was answered on a 3-point scale (1=hardly ever; 2=some of the time; 3=often). The UCLA Loneliness Scale has shown satisfactory reliability and both concurrent and discriminant validity [17]. In the present study, the 3-item UCLA Loneliness Scale showed acceptable internal reliability (Cronbach's alpha=0.89; average inter-item correlation=0.72). The scores for each item were added up to produce a loneliness scale from 3 to 9, with higher scores indicating a greater degree of loneliness. The cut-off point for loneliness was ≥ 6 , in line with previous studies [18].

Social Network Components

A detailed description of the individual's social network was obtained which included the following components: 1) size of the network; 2) frequency of contact with members of the network; and 3) quality of the network. These social network

components are based on the structural dimension of the Berkman-Syme Social Network Index [19], which measures the size of the social network, closeness with members of the network, and frequency of contact. Size of the network was assessed by asking about the number of people in the network (i.e., “*Please state the number of people [in total] who are so close to you at the present time that you: can talk to them about personal affairs, can get help from them in everyday matters, and/or enjoy spending your leisure time with them [please consider family members, friends, colleagues, etc.]*”). Frequency of contact with members of the network (also known as intensity of the network) and quality of the network were assessed with an index ranging from 0 to 8 by asking whether the participant had contact with the members of the network at least once per month in the previous 12 months and whether they had a close relationship with the participant. One point was assigned for each of the eight types of relationship: spouse or partner, parents, children, grandchildren, other relatives, co-workers, friends, and neighbors. This scoring method is based on the Social Network Index proposed by Cohen [20], which assesses several types of relationships and has recently been validated for different European countries [21]. Total scores were dichotomized using the median value of frequency of contact and quality and size of the social network.

Depression

An adapted version of the Composite International Diagnostic Interview (CIDI 3.0) was used to assess the presence of depression in the previous 12 months [22]. An algorithm based on the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders was used [23].

Sociodemographic variables

Participants were also asked to provide socio-demographic information: age (in years), gender, level of education (less than primary, primary, secondary and tertiary), marital status (single, currently married or cohabiting, separated or divorced, and widowed), residential setting (rural, urban) and household income. Respondents were asked about household income through written statements and marking their best estimates of total household income on scales provided, including income from wages or stipends from a job as well as income from unemployment benefit, pensions, investments, aid to families or other government or non-government benefits during the previous 12 months. This variable was divided into three levels; the first was formed from the values of the first quartile, the second from the values of the second and third quartiles and the third from the values of the fourth quartile, according to the household income of the sample.

Statistical analysis

The statistical analyses took into account the stratified study design. Post-stratification corrections were made to the weights to adjust for the population distribution obtained from the national census and for non-response [24].

Descriptive analyses were conducted to characterize the study sample. These analyses included unweighted frequencies, weighted proportions, and weighted mean age and standard deviation. The factors associated with loneliness and depression separately were analyzed through bivariable logistic regression models. Odds ratio (95% CI) and *p* values were reported.

Several logistic regression models were fitted to test the relationship of each social network component and marital status with depression and loneliness (data not shown but available upon request). Those variables that predicted the outcome ($p < 0.20$) [25], as well as all significant interactions with depression or loneliness

($p < 0.05$), were introduced into multivariable logistic regression models. Odds ratio (95% CI) and p values were reported in each model. Probabilities (95% CI) for loneliness and depression adjusted for remaining significant covariates were also calculated, stratifying by marital status, size of the social network and the presence of depression or loneliness, according to significant interactions in each model. Stata version SE 12 was used to analyze the survey data.

Results

The socio-demographic characteristics of the study sample are illustrated in Table 1. A total of 3,535 participants aged ≥ 50 years was included in the analysis. Mean age was 66.5 years (SD=10.6) and 54.1% of the sample was female. Thirteen percent of the participants reported feelings of loneliness and the prevalence of depression was 12.1% in the overall sample.

Several factors associated with higher odds for loneliness were identified in the bivariable logistic regression analyses. Being female, older, previously or never married, with a lower level of education, having medium family income, not working and being depressed were associated with a higher probability of presenting feelings of loneliness. Moreover, scores below the median in the three social network components (i.e., size, frequency and quality of the network) were related to lower odds for loneliness. All these factors were also associated with higher odds for depression apart from age and size of social network.

The multivariable analysis (Table 2) reported factors related to loneliness and depression separately. Being unmarried (never married, separated, divorced or widowed), depressed and with scores above the median in size of social network were associated with lower odds for loneliness, as in the bivariable analysis. Furthermore,

we also found a significant association between living in rural setting and higher odds for loneliness. Conversely, frequency of contact, quality of the network, educational level, employment status and household income were no longer associated with loneliness. The interactions between marital status and depression, and between size of social network and depression were statistically significant.

All bivariate associations remained significantly associated with depression in the multivariable analysis apart from frequency of contact and quality of network. Age was also associated with depression, with the youngest cohort having higher odds for depression. Size of social network and loneliness, and marital status and loneliness were significant interactions in this model.

Figure 1 shows estimated probabilities of loneliness in depressed vs. non-depressed people according to size of social network for distinct marital status categories. Loneliness was related to the size of social network and marital status. However, the relationship varied with depression status: among people without depression, being married was the most relevant factor in feeling lonely; while among people with depression the most powerful correlate was having a small social network. Figure 2 shows probabilities for depression in lonely vs. non-lonely people stratified by the same factors. Among people without loneliness, higher probabilities of depression were related to having previously been married but not having a small social network, whereas being married and having a small social network was associated with the highest probability of suffering from depression among people with loneliness.

Discussion

To the best of our knowledge, this is the first study to examine, in a representative sample of the Spanish older adult population, the role of the social network and depression in the experience of loneliness; as well as the role of the social network and loneliness in the experience of depression. Significant differences in the relevance of the size of social network and marital status were found when comparing participants with and without depression, or with and without loneliness. Having a small social network impacted depression only in those people who were lonely. Further, having a small social network was associated with loneliness in particular in those who are depressed. In contrast, in non-depressed people, loneliness was more related to marital status than size of social networks. These results are generally consistent with previous studies that support an interaction between social networks, loneliness and depression. For example, social isolation [26] or depression [27] only predicted mortality in individuals who feel lonely. In summary, these results confirm our initial hypothesis that emotional and social loneliness have a distinct impact on depression.

Surprisingly, in those who do not feel lonely, a large social network was associated with a higher frequency of depression. Additionally, married individuals who feel lonely have a higher than fifty percent estimated probability of being depressed. Negative interactions, which have not generally been taken into consideration when studying social networks and mental health, may help explain these relationships [6]. In general, the findings of the present study are also consistent with by the model suggested by Cacioppo *et al.* According to these authors, loneliness occurs in clusters, extends up to three degrees of separation in the social network, is disproportionately represented at the periphery of social networks, and spreads

through a contagious process [28]. Rosenquist *et al.* also suggested that depression followed a similar process of spreading through the social network, with higher levels of depression in individuals with a smaller number of contacts [29].

In line with these models, we suggest that two types of loneliness exist depending on the position held by the individual in the social network. The first type, which would be experienced by individuals on the periphery of the social network (i.e., individuals with fewer contacts), would be more closely related to depression, which in turn, has been associated with lack of social support. In individuals with central positions in the social network, i.e., those with a higher number of links, loneliness is not explained by the social network or associated with depression. In these individuals, marital status has greater influence on loneliness. The possible existence of loneliness subtypes is consistent with the need to distinguish between emotional and social loneliness to improve the effectiveness of interventions reduce loneliness, as suggested by other researchers [30].

Qualitative studies explaining the perception of loneliness in individuals with and without depression support our hypothesis about distinct loneliness subtypes. Cohen-Mansfield *et al.* recommended addressing the understanding of loneliness from specific contexts [4], Van Beljouw *et al.* stressed the need to pay attention to feelings of loneliness in elderly people with depressive symptoms due to its high prevalence and consequences for mental health [31], Lindgren *et al.* detected high levels of stigma among people suffering from mental disorders and loneliness [32] while Taube *et al.* defined the experience of loneliness among frail, elderly people as a struggle to overcome physical limitations and psychological and social barriers [33].

The prevalence of high odds for loneliness (≥ 6 UCLA total score) was 12.1%, which is similar to that reported in a previous study [3]. However, different

measurement methods complicate comparisons between studies, a fact evidenced in a study of 3,008 American participants aged 50 years or more, where loneliness was measured in two ways: by a cut point of ≥ 6 in the 3-item UCLA loneliness scale, and by asking whether individuals had feelings of loneliness much of the time over the previous week, a similar question to that used by Yang and Victor in their study [3]. Shiovitz-Ezra and Ayalon reported that only 45% of people who were classified as lonely by the direct question were classified in the same way by the UCLA loneliness scale, demonstrating that distinct measures of loneliness capture different characteristics of people who suffer from it [34].

The prevalence of depression in our study was 12.1%, which is much higher than the prevalence shown by a previous study on a representative sample of the population in Spain (4.0%) [35]. However, the prevalence reported in the present study is similar to that shown by some studies with representative samples from other countries, such as a prevalence of 10.3% in the United States [36].

Apart from the social network components and loneliness or depression status, being female, 50-65 years old, previously married (separated or divorced), not working, with a lower level of education and a medium household income were associated with higher odds for depression in the overall sample, which is quite consistent with previous research [35], whereas living in a rural area and being unmarried were associated with higher odds for loneliness. Therefore, most socio-demographic factors associated with loneliness and depression in the bivariable model do not remain as significant correlates of loneliness after the association is adjusted for depression. These results highlight the need to take into account the role of depression and social networks in studies on the correlates of loneliness or protective measures against it.

Strengths and limitations of the study.

The strengths of our study include the use of a large amount of community-representative data, with a sample of older adults from a variety of socio-economic backgrounds, and the ability to control for confounding factors. However, we need to consider several limitations associated with our findings. First, the cross-sectional design limited the possibility of examining causal relationships. Second, inconsistencies between the distinct techniques for measuring loneliness impede comparability between studies. Finally, it is possible that some of the findings are influenced by the cognitive distortions individuals with experience of depression [37] or other factors. For instance, some of the variables were collected retrospectively through self-report, which may result in recall or reporting bias. Nevertheless, it should be mentioned that most epidemiological studies have used self-reported data, and recall biases are usually relatively minor [38].

Conclusions.

Although many studies based on addressing maladaptive social cognition showed greater effectiveness in reducing loneliness than others based on increasing social interactions and communication skills [39], the results of this study show the need to examine the role of the social network in the feelings of loneliness among older adults with depression, taking into account their social and demographic characteristics and health status. In future research in this field, in addition to the role of the social network, the quality of various kinds of social interaction needs to be taken into account. In the case of older Spanish adults with depression, the reconstruction of degraded social networks over time seems essential, and therefore interventions based on this could be more beneficial than others based on cognitive behavioral therapy in reducing loneliness and depression.

This study contributes to raising awareness of the need for longitudinal studies that allow the consideration of temporary associations and causality, along with qualitative studies which explore whether discourse about loneliness changes according to the health and social conditions. Despite valuable initiatives [40], we are far from implementing social policies to reduce the risk of loneliness in older adults and have an impact on the prevalence of depression, which is currently the most widespread mental disorder and one which represents a huge challenge for the international community.

Conflict of interest.

Dr. Josep Maria Haro is a consultant of Eli Lilly and Co, Roche, Lundbeck and Otsuka. None of these activities are related to the current project. For the remaining authors, none were declared.

Table 1. Characteristics of the study sample and related factors to loneliness and depression.

Characteristics	Overall (n=3,535) (n, %)	Loneliness ^a		Depression ^b	
		Odds ratio (95% CI)	<i>p</i> value	Odds ratio (95% CI)	<i>p</i> value
Gender					
Male	1595 (45.9%)	Ref.		Ref.	
Female	1940 (54.1%)	2.03 (1.57, 2.64)	<0.001	2.80 (2.04, 3.84)	<0.001
Age groups (Mean= 66.5, SD=10.6)					
50-65 years	1817 (49.8%)	Ref.		Ref.	
66-80 years	1362 (39.8%)	1.33 (1.00, 1.77)	0.049	0.94 (0.67, 1.31)	0.701
80+ years	342 (10.4%)	1.60 (1.00, 2.589)	0.052	1.02 (0.66, 1.57)	0.925
Marital Status					
Married or cohabiting	2191 (61.8%)	Ref.		Ref.	
Never married	307 (8.6%)	4.03 (2.46, 6.61)	<0.001	1.05 (0.68, 1.63)	0.810
Previously married	1037 (29.6%)	6.07 (4.45, 8.29)	<0.001	2.32 (1.74, 3.10)	<0.001
Residential setting					
Urban	3049 (83.4%)	Ref.		Ref.	
Rural	486 (16.6%)	1.40 (0.96, 2.05)	0.082	1.04 (0.73, 1.49)	0.817
Level of education					
No education ^c	1145 (31.6%)	Ref.		Ref.	
Primary Education	1067 (31.9%)	0.77 (0.55, 1.08)	0.125	0.49 (0.37, 0.66)	<0.001
Secondary education	934 (25.7%)	0.58 (0.42, 0.819)	0.001	0.49 (0.34, 0.71)	<0.001
College / University	388 (10.9%)	0.41 (0.26, 0.639)	<0.001	0.31 (0.10, 1.00)	0.050
Employment status					
Working	834 (23.8%)	Ref.		Ref.	
Retired/ disabled	1568 (46.7%)	1.95 (1.30, 2.93)	0.001	2.69 (1.60, 4.53)	<0.001
Homemaker/unpaid work	790 (22.2%)	2.45 (1.67, 3.58)	<0.001	4.19 (2.50, 7.03)	<0.001
Unemployed	251 (7.3%)	1.71 (0.97, 3.03)	0.063	4.81 (3.01, 7.69)	<0.001
Household income					
High	769 (23.3%)	Ref.		Ref.	
Medium	1583 (49.1%)	2.11 (1.60, 2.77)	<0.001	2.62 (1.92, 3.57)	<0.001
Low	828 (27.6%)	1.40 (0.99, 1.989)	0.060	1.85 (1.11, 3.06)	0.018
Size of the network					
Below the median	1729 (49.6%)	Ref.		Ref.	
Above the median	1723 (50.4%)	0.42 (0.31, 0.56)	<0.001	0.80 (0.56, 1.13)	0.199
Frequency of contact					
Below the median	2029 (57.3%)	Ref.		Ref.	
Above the median	1506 (42.7%)	0.22 (0.17, 0.30)	<0.001	0.51 (0.40, 0.65)	<0.001
Quality of the network					
Below the median	1792 (50.6%)	Ref.		Ref.	
Above the median	1743(49.4%)	0.21 (0.16, 0.27)	<0.001	0.46 (0.35, 0.61)	<0.001
Loneliness					
No	3062 (86.9%)	-		Ref.	
Yes	473 (13.1%)	-	-	6.66 (5.00, 8.89)	<0.001
Depression					
No	3062 (87.9%)	Ref.		-	-
Yes	434 (12.1%)	6.66 (4.99, 8.89)	<0.001	-	-

Unweighted frequencies (n), and weighted proportions are displayed for overall whereas odds ratio (95% CI) and *p* value are displayed for related factors to depression and loneliness or as otherwise indicated.

^a Loneliness is defined as having a score above 5 in the UCLA loneliness scale.

^b Depression refers to major depression in the previous twelve months and it was assessed with the Composite International Diagnostic Interview (CIDI).

^c "No education" includes those people who had never been to school or did not finish primary school.

Abbreviations: SD=Standard deviation; CI=Confidence Interval; Ref=Category of reference.

Table 2. Multivariable logistic regression models of the factors associated with loneliness and depression.

Characteristics	Loneliness ^a OR (95% CI)	Depression ^a OR (95% CI)
Intercept	0.59*** (0.03, 0.12)	0.03*** (0.01, 0.08)
Gender		
Male	Ref.	Ref.
Female	0.95 (0.64, 1.40)	1.84*** (1.26, 2.68)
Age groups		
50-65 years	Ref.	Ref.
66-80 years	0.80 (0.55, 1.15)	0.44*** (0.31, 0.64)
80+ years	0.64 (0.36, 1.14)	0.38** (0.22, 0.66)
Marital Status		
Married or cohabiting	Ref.	Ref.
Never married	3.81*** (1.93, 7.50)	0.64 (0.31, 1.31)
Previously married	6.10*** (3.55, 10.48)	1.41 (0.91, 2.19)
Residential setting		
Urban	Ref.	-
Rural	1.58* (1.01, 2.48)	-
Level of education		
No education ^a	Ref.	Ref.
Primary education	1.01 (0.64, 1.60)	0.44*** (0.31, 0.61)
Secondary education	0.92 (0.59, 1.42)	0.56* (0.35, 0.91)
College / University	0.80 (0.42, 1.51)	0.56 (0.19, 1.60)
Employment status		
Working	Ref.	Ref.
Retired/ disabled	1.29 (0.80, 2.09)	3.08*** (1.72, 5.49)
Unpaid work	1.23 (0.75, 2.04)	3.28*** (1.82, 5.91)
Unemployed	1.18 (0.58, 2.40)	3.95*** (2.08, 7.52)
Household income		
High	Ref.	Ref.
Medium	1.22 (0.82, 1.82)	1.70* (1.08, 2.68)
Low	0.89 (0.57, 1.39)	1.42 (0.78, 2.58)
Size of the network		
Below the median	Ref.	Ref.
Above the median	0.59** (0.40, 0.87)	1.57* (1.02, 2.41)
Frequency of contact		
Below the median	Ref.	Ref.
Above the median	0.78 (0.45, 1.36)	0.77 (0.47, 1.24)
Quality of the network		
Below the median	Ref.	Ref.
Above the median	0.73 (0.44, 1.22)	0.81 (0.48, 1.37)
Depression		
No	Ref.	-
Yes	16.47*** (9.92, 27.37)	-
Loneliness		
No	-	Ref.
Yes	-	15.96*** (9.16, 27.79)
Interactions^b		
Marital Status	(x depression)	(x loneliness)
Married or cohabiting	Ref.	Ref.
Never married	0.59 (0.18, 1.99)	0.58 (0.19, 1.72)
Previously married	0.29*** (0.16, 0.52)	0.32*** (0.18, 0.57)
Size of the network	(x depression)	(x loneliness)
Below the median	Ref.	Ref.
Above the median	0.33** (0.16, 0.68)	0.31** (0.15, 0.62)

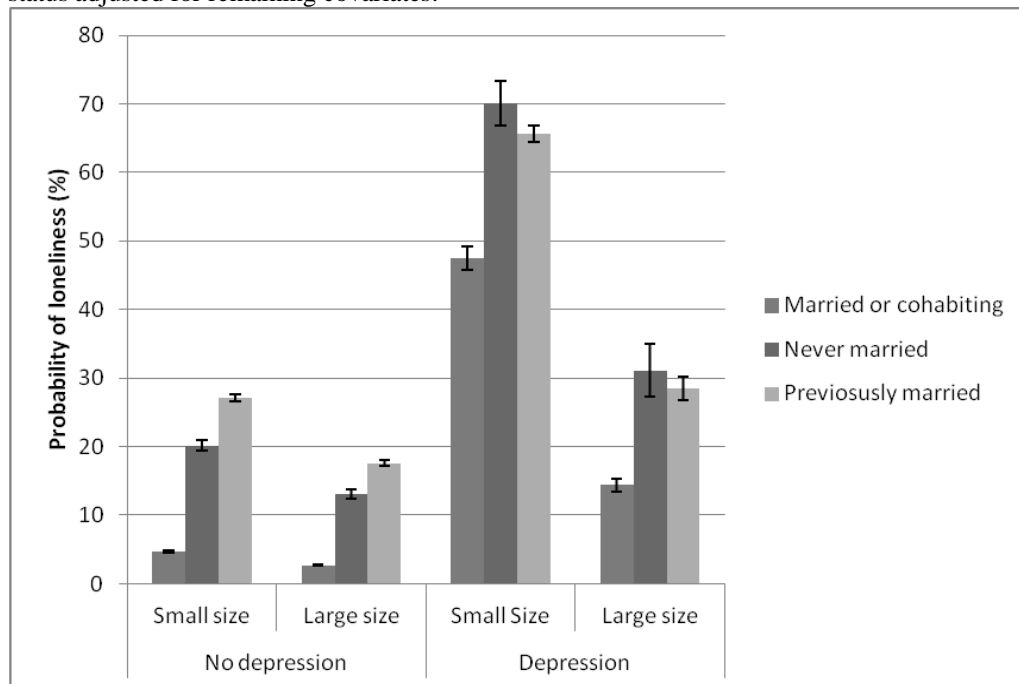
^a Only the covariates which were significant in the bivariable model ($p < 0.20$) were included in the multivariable model apart from age groups and gender.

^b Only the interaction which were significant in the bivariable model ($p < 0.05$) were included in the multivariable model. These interactions were marital status and size of social network with depression for loneliness as outcome and with loneliness for depression as outcome.

Abbreviations: CI=Confidence Interval, Ref=Reference category; OR=Odds ratio.

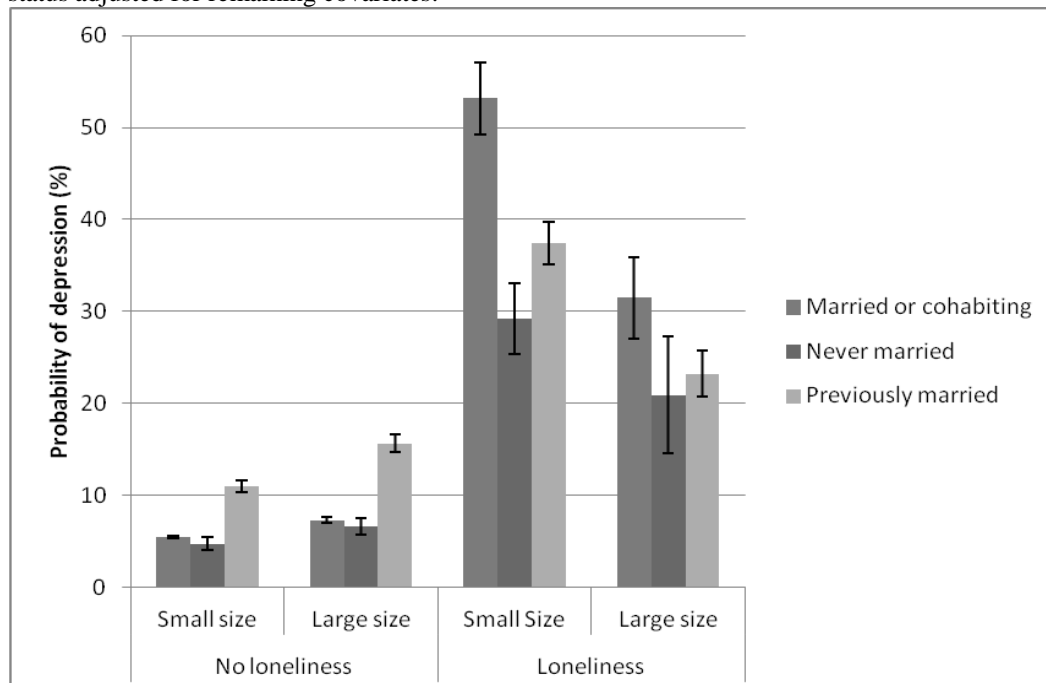
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 1. Probability (95% CI) of loneliness by depression status, size of the social network and marital status adjusted for remaining covariates.



Note= Large size is above the median and small size below or equal the median.

Figure 2. Probability (95% CI) of depression by loneliness status, size of the social network and marital status adjusted for remaining covariates.



Note= Large size is above the median and small size below or equal the median.

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